WHAT IS CLAIMED IS:

1. A crystalline semiconductor thin film, wherein:

a carbon content and a nitrogen content are 5×10^{18} atoms/cm^3 or less, and an oxygen content is 1.5×10^{19} atoms/cm^3 or less;

a main orientation plane is a {110} plane;

an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°;

a film thickness is 5 to 40 nm; and

the semiconductor thin film is made of single crystal or substantially single crystal.

2. A crystalline semiconductor thin film, wherein:

a carbon content and a nitrogen content are 1×10^{18} atoms/cm^3 or less, and an oxygen content is 5×10^{18} atoms/cm^3 or less;

a main orientation plane is a {110} plane;

an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°;

a film thickness is 5 to 40 nm; and

the semiconductor thin film is made of single crystal or substantially single crystal.

3. A semiconductor device including a circuit which is constituted by a thin film transistor having a semiconductor thin film as a channel formation region, wherein the semiconductor thin film is characterized in that:

a carbon content and a nitrogen content are 5 x 10^{18} atoms/cm^3 or less, and an oxygen content is 1.5 x 10^{19} atoms/cm^3 or less;

a main orientation plane is a {110} plane;

an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°;

a film thickness is 5 to 40 nm; and

the semiconductor thin film is made of single crystal or substantially single crystal.

4. A semiconductor device including a circuit which is constituted by a thin film transistor having a semiconductor thin film as a channel formation region, wherein the semiconductor thin film is characterized in that:

a carbon content and a nitrogen content are 1 x 10^{18} atoms/cm^3 or less, and an oxygen content is 5 x 10^{18} atoms/cm^3 or less;

a main orientation plane is a {110} plane;

an absolute value of a rotation angle made by equivalent axes between adjacent crystal grains or by axes in rotation relation of 70.5° with respect to the equivalent axes is within 4°;

a film thickness is 5 to 40 nm; and

the semiconductor thin film is made of single crystal or substantially single crystal.

SUB B1

5. A method of fabricating a crystalline semiconductor thin film, comprising the steps of:

adding a catalytic element for facilitating

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crystallization of an amorphous semiconductor thin film to the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the amorphous semiconductor thin film into a crystalline semiconductor thin film by irradiating ultraviolet light or infrared light; and

carrying out a second heat treatment for the crystalline semiconductor thin film at 900 to 1200°C in a reducing atmosphere.

6. A method according to claim 5, wherein the second heat treatment is a furnace annealing.

7. A method according to claim 5, wherein the second heat treatment is carried out in the reducing atmosphere in which a concentration of oxygen or an oxide compound is not higher than 10 ppm.

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8. A method of fabricating a crystalline semiconductor thin film, comprising the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the amorphous semiconductor thin film into a crystalline semiconductor thin film by irradiating ultraviolet light or infrared light; and

carrying out a second heat treatment for the crystalline semiconductor thin film in a reducing atmosphere including a halogen element.

9. A method according to claim 8, wherein the second heat treatment is carried out at a temperature of 900 to 1200°C.

SUB B3 10. A method according to claim 8, wherein the second heat treatment is a furnace annealing.

11. A method according to claim 8, wherein the second heat treatment is carried out in the reducing atmosphere in which a concentration of oxygen or an oxide compound is not higher than 10 ppm.

SUB B4 12. A method of fabricating a crystalline semiconductor thin film, comprising the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the amorphous semiconductor thin film into a crystalline semiconductor thin film by irradiating ultraviolet light or infrared light; and

carrying out a second heat treatment for the crystalline semiconductor thin film at 900 to 1200°C in a reducing atmosphere.

13. A method according to claim 12, wherein the second heat treatment is carried out at a temperature of 900 to 1200°C.

14. A method according to claim 12, wherein the second heat treatment is a furnace annealing.

15. A method of fabricating a crystalline semiconductor thin

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film, comprising the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the amorphous semiconductor thin film into a crystalline semiconductor thin film by irradiating ultraviolet light or infrared light; and

carrying out a second heat treatment for the crystalline semiconductor thin film in a reducing atmosphere including a halogen element.

16. A method according to claim 15, wherein the second heat treatment is carried out at a temperature of 900 to 1200°C.

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17. A method according to claim 15, wherein the second heat treatment is a furnace annealing.

18. A method according to claim 15, wherein the second heat treatment is carried out in the reducing atmosphere in which a concentration of oxygen or an oxide compound is not higher than 10 ppm.

Add A1

add B8

Add C2